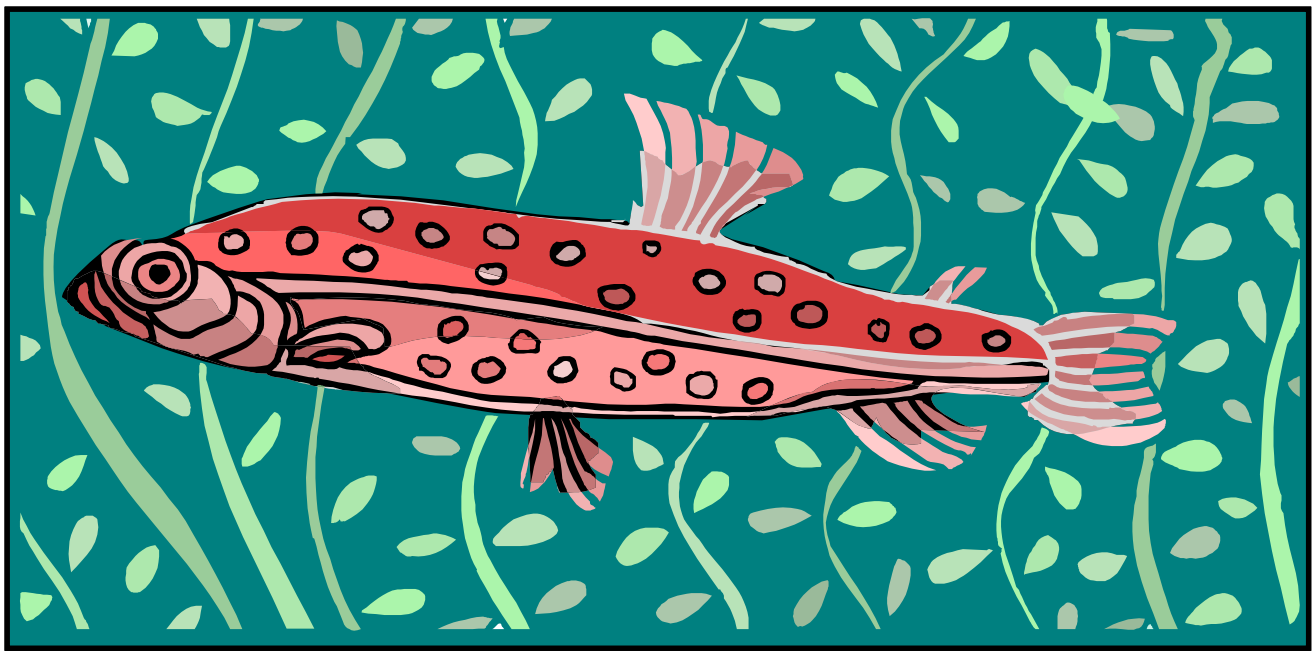
Salmon Habitat Protection and Restoration Strategy



WRIA-10
Puyallup Watershed

WRIA-12
Chambers/Clover Creek Watershed

Pierce County
Lead Entity

February 25, 2004

Salmon Habitat Protection and Restoration Strategy

For 5th Round

February 25, 2004

"Chambers/Puyallup Partners for Salmon Recovery"

Puyallup (WRIA 10)

and

Chambers/Clover Creek (WRIA 12)

Watersheds

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Salmon Habitat Protection and Restoration Strategy

For 5th Round

February 25, 2004

"Chambers/Puyallup Partners for Salmon Recovery"

Puyallup (WRIA 10) and Chambers/Clover Creek (WRIA 12) Watersheds

The 1999 Washington Legislature created and authorized the Salmon Recovery Funding Board (SRFB) to guide spending of funds targeted for salmon recovery activities and projects. The legislation also included a ranking process that provides an opportunity for local organizations to prioritize projects from their watersheds before they are submitted to the SRFB. (The process is sometimes referred to as "2496" based on the number of legislature's bill that created it.)

Pierce County serves as the "Lead Entity" for the Puyallup and Chambers-Clover watersheds ranking process. It should be noted that projects from both watersheds are ranked together and only one list is submitted to the SRFB for consideration.

Project ranking is performed by a "Citizens' Advisory Committee" (CAC) of stakeholders from both watersheds.

The CAC is guided in their ranking by a "Technical Advisory Group" (TAG). The TAG provides a preliminary project ranking which is based on a scientific assessment of each project's benefit to fish and likelihood of success.

This strategy document describes the criteria that both the CAC and TAG consider when evaluating the desirability of salmon recovery projects.

MISSION

The mission of the CAC is to support the recovery of self-sustaining, harvestable salmon populations in Puget Sound by restoring and protecting the habitat in WRIA's 10 and 12.

GOAL

The goal of the Salmon Habitat Protection and Recovery Strategy is to provide guidance to the CAC and TAG, the SRF Board and Project Sponsors to identify and prioritize salmon habitat recovery projects in WRIA's 10 and 12.

INTRODUCTION

We now know that the most important actions for salmon recovery in the Puyallup Watershed are large-scale floodplain reconnections to the mainstem rivers. These will be expensive and difficult to implement and will not occur soon or rapidly. However, efforts are underway to increase capacity and support for these actions.

We can accomplish other important actions in the near-term with moderate to high benefits and certainty. These actions are described in some detail in Chapter 7. Briefly, in WRIA 10 these near-term high-priority actions include protection and/or restoration on presently functional salmon streams, including:

- South Prairie Creek and its tributaries
- Boise Creek
- Greenwater River
- Huckleberry Creek

In WRIA 12 near-term high-priority actions include:

- Passage restoration at three specific barriers;
- Restoration of flow in seasonally dry sections of Clover Creek;
- A nearshore assessment; and
- Projects to restore in-stream habitat diversity (LWD) may be high priorities if they are cost effective and properly sequenced relative to other restoration needs.

The following paragraphs describe the organization of the document:

Chapter 1 - Identify and Prioritize Stocks: The Lead Entity, CAC and TAG will pursue the recovery of White River spring chinook[1], and Puyallup River fall chinook in WRIA 10; and Chambers Creek coho in WRIA 12. The decline of steelhead is of concern.

Chapter 2 - Priority Stocks' Status: We can improve stocks by increasing the abundance, productivity, life history diversity, and spatial distribution for White River spring chinook, Puyallup River fall chinook, and Chambers Creek coho.

Chapter 3 - Determine Limiting Habitat Features and Watershed Processes: Limiting habitat features within WRIA's 10 and 12 include: loss of off-channel habitat, the disconnection of floodplain habitat, alteration of natural flow regimes, loss of riparian function, and habitat complexity and connectivity.

Chapter 4 – High-Priority Areas for Restoration: The high-priority areas for restoration in WRIA 10 are the lower and middle Puyallup River, the lower White River, the lower Carbon River, and the Puyallup estuary. The high-priority area for restoration in WRIA 12 is the mainstem Clover Creek above Steilacoom Lake.

[1] Recent evidence suggests the presence of a fall chinook stock in the White River in addition to the spring chinook stock. The fall stock includes a Puget Sound hatchery origin chinook, as demonstrated by mark and tag recoveries at the Corps of Engineers and White River Hatchery traps. For the present we will not differentiate between the White River chinook stocks in prioritizing projects.

Chapter 5 - Identify and Prioritize Actions: Priority actions in WRIA 10 include: Levee set-backs[2], estuarine habitat creation, increased flows in the hydroelectric diversion reach, remove artificial barriers, restore habitat diversity[3] and riparian conditions in tributary streams.

In WRIA 12, the widespread addition of Large Woody Debris (LWD) to restore habitat diversity and complexity would be highly beneficial, as would the correction of certain barriers, restoring summer flows, and riparian restoration.

Chapter 6 - Socio-Economic Objective (CAC): Salmon recovery cannot be divorced from the context of the surrounding community. With this in mind the CAC has created the following four categories or actions as a tool or threshold to measure socio-economic values of each project.

Action: A) INCREASE PUBLIC RECOGNITION, SUPPORT AND STEWARDSHIP

Action: B) ENCOURAGE COOPERATIVE WATERSHED PARTNERSHIPS

Action: C) SUPPORT INTEGRATED AND COMPATIBLE LAND USES

Action: D) ECONOMIC SUCCESSES

Chapter 7 – Near-term Actions: Over the long-term, projects to construct levee setbacks, re-store floodplain connectivity, restore estuarine habitat, or to screen the Electron diversion will be high priorities in WRIA 10. In the Near-term Actions, we will support projects that protect and/or improve habitat in presently productive streams or that correct barriers to high quality habitat.

In WRIA 12, projects to correct significant barriers, place LWD, and restore riparian conditions may be high priorities if they are cost effective. Assessment(s) of the nearshore area that lead to restoration actions would be of high-priority.

Chapter 8 - Project Ranking Criteria: The TAG will create a ranked list based on scientific criteria which will include the categories of high, medium, and low benefit & high, medium, and low certainty as well as raw scores.

The CAC will score projects based on the 13 bulleted social and economic criteria listed in Chapter 6.

[2] Levee setbacks can result in re-connecting large areas of floodplain to the main river. They allow natural processes to create side-channel and off-channel habitat areas. Oxbow and off-channel habitat reconnections can provide similar benefits by providing water and fish access to existing habitat.
[3] Habitat diversity includes pool/riffles, LWD, etc.

ACKNOWLEDGMENTS

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INTRODUCTION AND BACKGROUND

The 1999 Washington Legislature created and authorized the **Salmon Recovery Funding Board (SRFB)** to guide spending of funds targeted for recovery activities and projects. In addition to creating the SRFB, the legislature provided guidance on the ranking process for funding projects. That ranking process includes an opportunity for local organizations to prioritize projects from their watersheds before submission to the SRFB. The process is sometimes referred to as "2496" based on the House bill number that created it. RCW, Chapter 77.85 codifies this legislation.

Pierce County applied to be the "Lead Entity" for the Puyallup and Chambers-Clover watersheds ranking process in 1999. The County continues to serve in that capacity.

Project ranking is performed by a "Citizens' Advisory Committee" (CAC) of stakeholders from both watersheds. The Pierce County Executive, with recommendations from the Puyallup River Watershed Council (PRWC) and the Chambers-Clover Creek Watershed Council (CCWC), appointed members of the CAC reflecting stakeholder representation required by state statute. The committee ranks projects from both watersheds and submits a single list to the SRFB for consideration.

The CAC is guided in their ranking by a "Technical Advisory Group" (TAG). The TAG provides a preliminary project ranking which is based on a scientific assessment of each project's benefit to fish and likelihood of success.

This strategy document describes the criteria that both the CAC and TAG consider when evaluating the desirability of salmon recovery projects.

MISSION

Our mission is to support the recovery of self-sustaining, harvestable salmon populations in Puget Sound by restoring and protecting the habitat in WRIA's 10 and 12.

GOAL

The goal of the Salmon Habitat Protection and Restoration Strategy is to provide guidance to the CAC and TAG, the SRF Board and Project Sponsors to identify and prioritize salmon habitat recovery projects in WRIA's 10 and 12.

Chapter 1

"IDENTIFY AND PRIORITIZE STOCKS"

The Pierce County Lead Entity for SRFB projects will pursue the recovery of White River spring chinook[4], and Puyallup River fall chinook in WRIA 10, and Chambers Creek coho in WRIA 12.

The precipitous decline of steelhead in WRIA's 10 and 12 is of particular concern to the Lead Entity. We recommend further analysis to determine the needs of steelhead in the Watershed.

The WRIA 10 chinook stocks are priorities because of their ESA threatened status and because they are priorities in the SRFB funding process.

Coho are a priority in WRIA 12 because the Watershed was historically highly suited to coho salmon, and because chinook do not presently use the freshwater habitat in WRIA 12[5]. It appears that a population of coho is still present in WRIA 12, though at relatively low numbers[6]. Recent analyses (Pierce County, June 2001) indicate coho would make an excellent indicator species for formulating watershed action plans to address salmonid conservation and recovery needs in WRIA 12.

Chinook salmon do not use the freshwater habitat of Chambers Creek because returning adults are intercepted at Chambers Bay either by the terminal fishery or are trapped for hatchery production at the upper end of the bay. Since the ESA listing of chinook, it has been WDFW policy to not pass any chinook upstream. Recent studies have documented that juvenile chinook salmon make extensive use of nearshore habitat.

WRIA 12 nearshore habitat protection and/or restoration are also a priority because both Nisqually and Puyallup River chinook[7] and other stocks use this nearshore habitat. While there is some uncertainty about the relative benefits of nearshore habitat to chinook performance, there is general agreement that it is important. Assessment(s) of the nearshore area that lead to restoration actions would be of high-priority.

The Pierce County Lead Entity organization considers steelhead stocks to be of high significance. Steelhead stocks status in the Watershed are depressed, and may be critical in

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[4] Recent evidence suggests the presence of a fall chinook stock in the White River in addition to the spring chinook stock. The fall stock includes a Puget Sound hatchery origin chinook, as demonstrated by mark and tag recoveries at the Corps of Engineers and White River Hatchery traps. For the present, we will not differentiate between the White River chinook stocks in prioritizing projects.

[5] The "Ecosystem Diagnosis and Treatment" (EDT) analysis indicated that Chambers Creek historic chinook abundance may have been 2100 spawners and could be 350 under restored conditions. However, the study also concluded that it might be unlikely that such a small watershed could sustain an independent population. The Washington State Department of Fish and Wildlife considers chinook in small watersheds like Chambers to be "sink" populations that do not meet the definition of viable self-sustaining populations.

[6] As of Oct 22, 2003, 455 coho had passed through the trap at the head of Chambers Bay. This is an improvement over recent years.

[7] Nisqually Tribe coded wire tag data, Sayre Hodgson, personal communication, 2004.

the view of the TAG. Steelhead once were abundant in the Puyallup and habitat protection and restoration is very important. While there is little understanding of those factors limiting steelhead performance in the Watershed, we think that our strategy to protect and restore chinook habitat will benefit steelhead. We may direct actions towards protection and/or restoration of steelhead habitat as we learn more.

United States Fish & Wildlife Service (USFWS) has listed bull trout threatened under the ESA. For this interim strategy, we have not prioritized bull trout, but have concluded that forest protection activities in the Watershed as well as our strategy to protect and restore chinook habitat will benefit bull trout. We may direct actions towards protection and/or restoration of bull trout habitat as we learn more from ongoing studies.

Bull trout spawning and rearing areas are in the higher altitude, forested portions of the Watershed, and habitat should improve as the riparian forest matures due to implementation of the Forest Plan on federal lands and improved forest management practices on private timber lands subject to state regulations. The *Interim Guidance for Protecting and Restoring Bull Trout Habitat* (draft November 27, 2002) concluded that efforts aimed at near-term protection and recovery actions for chinook salmon will generally address the needs of bull trout throughout their migratory and foraging corridors but may not address bull trout use in higher elevation portions of the basin. Also, by protecting and restoring watershed processes that provide for a wide diversity of salmon species, watershed productivity and available forage (predominately juvenile salmonids) should increase to levels that help ensure self-sustaining populations of bull trout.

The lead entity is preparing a document to describe stock status and trends for each of the SASI identified salmonid stocks present in WRIA's 10 and 12. We are not prioritizing additional stocks at this time, but expect that many of the proposed actions would benefit more than just the target stock(s).

Planning Targets for Recovery

WDFW and the Treaty Tribes have developed recovery planning ranges and targets (interim recovery goals) for abundance and productivity of the 22 independent populations that National Marine Fisheries Service (now NOAA Fisheries) Puget Sound Technical Recovery Team (TRT) identified (*Table 1*). Puyallup fall chinook targets and ranges were included, but the White River spring chinook ranges and targets have not been published, The Muckleshoot Tribe of Indians has used the SHIRAZ model to develop an estimate of White River spring chinook recovery targets and ranges that may be available in the future.

The planning ranges provide a broad estimate of the abundance needed for a population to be viable. The planning target provides a more specific measure within the range that is helpful for evaluating recovery actions in habitat, harvest and hatcheries. The target predicts the abundance and productivity of a salmon population based on a fully functioning estuary, improved freshwater conditions, restored access to blocked habitats, and poor ocean conditions.

We expect that the TRT and the co-managers will provide additional guidance on criteria for the other Viable Salmonid Population (VSP)[8] parameters, e.g. spatial structure and diversity in addition to abundance and productivity.

[8] Chapter 2 discusses VSP parameters in more detail. Also, refer to McElhany et al., (2000).

Puyallup River Chinook

The TRT planning targets for Puyallup chinook range from 5,300 (at productivity of 2.3) to 18,000 (productivity of 1.0). The Pierce County "Ecosystem Diagnostic and Treatment" (EDT) analysis[9] estimates potential abundance at 6,170 spawners after implementing a series of actions (see additional discussion in Chapter 5).

White River Chinook

The TRT has not yet provided recovery targets for White River chinook. However, we are aware of two recovery targets or estimates that may be useful for planning purposes. An interim recovery goal from the *Recovery Plan for White River Spring Chinook Salmon* (1996) was 1000 or more unmarked spawners per year in three of four consecutive years, with the normal level of incidental sport, commercial and tribal harvest. The long-term recovery goal was to meet an escapement goal that reflects watershed carrying capacity subject to a full complement of directed and incidental harvest in sport, commercial and tribal fisheries. The Recovery Plan did not suggest an associated number.

The EDT analysis for the White River estimated 2280 naturally spawning chinook in the upper and lower White River combined (assuming the continued operation of the White River hydroelectric facility. If the hydroelectric facility did not continue operations, the number of spawners was 3225.

Chambers/Clover Creek Coho

The Pierce County EDT analysis suggests that restoration actions in WRIA 12 could increase coho abundance by almost 300% from current average abundance of 700 spawners to 2660 spawners.

The Pierce County Lead Entity goal is to improve the performance of target stocks by increasing abundance, productivity, spatial structure and diversity. We will evaluate changes in performance based on the interim recovery targets where they have been identified.

[9] DRAFT - Strategic Priorities for Salmon Conservation and Recovery Actions in WRIAs 10 and 12, Mobrand Biometrics, Inc., December 2003.

Table 1

"Chinook Spawner Abundance Planning Targets & Ranges for Puget Sound Region"

(The table presents numbers for the populations with a completed analysis. State and tribal biologists are still developing the numbers for the populations that are blank.)

Population	Mean Spawner Abundance for 1996-2000	Low Productivity[1]		High Productivity[2]
		Planning Range for Abundance	Planning Targets for Abundance (productivity in parentheses)	
NF Nooksack	120	16,000-26,000 (1.0)	16,000 (1.0)	3,800 (3.4)
SF Nooksack	200	9,100-13,000 (1.0)	9,100 (1.0)	2,000 (3.6)
Lower Skagit	2,300	16,000-22,000 (1.0)	16,000 (1.0)	3,900 (3.0)
Upper Skagit	8,920	17,000-35,000 (1.0)	26,000 (1.0)	5,380 (3.8)
Upper Cascade	330	1,200-1,700 (1.0)	1,200(1.0)	290 (3.0)
Lower Sauk	660	5,600-7,800 (1.0)	5,600 (1.0)	1,400 3.0)
Upper Sauk	370	3,000-4,200 (1.0)	3,030 (1.0)	750 (1.0)
Suiattle	420	600-800 (1.0)	610 (1.0)	160 (2.8)
NF Stillaguamish	660	18,000-24,000 (1.0)	18,000 9(1.0)	4,000 (3.4)
SF Stillaguamish	240	15,000-20,000 (1.0)	15,000 (1.0)	3,600 (3.3)
Skykomish	1,700	17,000-51,000 (1.0)	39,000 (1.0)	8,700 (3.4)
Snoqualmie	1,200	17,000-33,000 (1.0)	25,000 (1.0)	5,500 (3.6)
NL Washington	194*			
Cedar	398*			
Green	7,191*			
White	329*			
Puyallup	2,400	17,000-33,000 (1.0)	18,000 (1.0)	5,300 (2.3)
Nisqually	890	13,000-17,000 (1.0)	13,000 (1.0)	3,400 (3.0)
Skokomish	1,500*			
Dosewallips	26	3,000-4,700 (1.0)		
Dungeness	123*	4700-8100 (1.0)		
Elwha	1,319*			

* Represents spawner escapement 1987-2001.

1. The low productivity number in both the range and the target represents one adult fish return per spawner, also called the equilibrium point of 1:1 (recruits per spawner).

2. The high productivity number represents the number of spawners at the point where the population provides the highest sustainable yield for every spawner. The productivity ratio is in parentheses for each population and represents the relationship of recruits per spawner (e.g., 3.8:1 for Upper Skagit).

Chapter 2

"PRIORITY STOCKS' STATUS"

We can improve stocks by increasing the abundance, productivity, life history diversity and spatial distribution for White River spring chinook, Puyallup River fall chinook and Chambers Creek coho.

Population performance can be thought of in terms of the four parameters (abundance, productivity, spatial structure, and diversity[10]) which National Marine Fisheries Service (McElhany et al., 2000) used to define a "Viable Salmonid Population (VSP)". Under contract to Pierce County, Mobrand Biometrics used EDT modeling to evaluate the abundance, productivity and life history diversity of chinook and coho in WRIA's 10 and 12. *Table 2* presents the EDT baseline conditions (historic and current equilibrium conditions).

As shown in *Table 2,* chinook baseline results for current conditions in WRIA 10 indicate greatly reduced abundances and exceptionally low productivity[11] (spawner values <2)[12] compared to estimated historic values. Total current abundance is about 2000 spawners, compared to an estimated more than 64,000 fish. Estimated historical productivity was 7-10 returns per spawner. Productivity correlates strongly with habitat quality and the decrease in productivity in the Puyallup-White system (including its estuary and bay[13]) is the result of severely degraded habitat. The reduced abundances are the expected result of chronically poor productivity.

The EDT authors emphasized their conclusion that the overall performance of naturally produced chinook in the White-Puyallup system appears to be exceptionally poor. They estimated that the productivities for chinook produced in the Puyallup, upper White, and lower White rivers are 1.5 or less (see *Table 2*). These values are aggregate values of population components that have different productivities, for example, South Prairie Creek chinook would have a productivity that exceeds 2.0. The recent evidence of high straying rates by Voights Creek hatchery fish and the natural production from those strays gives the impression of better chinook performance than is actually occurring for wild fish. Genetic studies by the co-managers are ongoing to assess the actual degree of hybridization that may be occurring.

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[10] Abundance is the number of individuals in a population at a given life stage or time; productivity or growth rate is the actual or expected ratio of abundance in the next generation to current abundance; spatial structure refers to how the abundance at any life stage is distributed among available or potentially available habitats; and diversity is the variety of life histories, sizes, and other characteristics expressed by individuals within a population.

[11] Productivity represents the density-independent reproductive rate (or success) of a life history pattern over an entire life cycle. It is probably the most critical measure of the resilience of a life history pattern. It determines the rate of loss that can be sustained.

[12] Values less than one are by definition not sustainable; as population productivity approaches 1 (e.g. values less than 2) the population is clearly at risk.

[13] For the EDT analysis we considered Commencement Bay actions and the Puyallup River estuary (mouth of the river to extent of tidal influence) actions separately. Both of these areas are part of the nearshore, as defined by the Puget Sound Nearshore Ecosystem Restoration Project (PSNERP).

Table 2

"Baseline performance estimates for chinook and coho salmon in Lower White, Upper White, Puyallup, Hylebos and Chambers-Clover basins[14]"

CHINOOK

Watershed	Average abundance		Productivity		Life history diversity	
	Historic	Current	Historic	Current	Historic	Current
Lower White	15,600	200	7.4	1.3	100%	40%
Upper White	6,700	500	9.7	1.5	100%	40%
Puyallup	42,000	1,300	9.6	1.3	100%	30%
Hylebos	500	40	15.6	2.6	100%	50%
Chambers-Clover	2,100	0[15]	22.0	0	100%	0%

COHO

Watershed	Average abundance		Productivity		Life history diversity	
	Historic	Current	Historic	Current	Historic	Current
Lower White	10,500	1,100	18.4	3.6	100%	40%
Upper White	13,500	1,200	17.4	2.0	80%	30%
Puyallup	56,700	5,200	19.6	5.9	90%	30%
Hylebos	1,800	200	25.0	6.5	100%	70%
Chambers-Clover	12,200	700	35.9	7.8	100%	40%

[14] Fisheries are turned off in this analysis so that only the effect of environmental condition is being assessed. This serves to standardize the analysis between watersheds and to focus attention on the effect of changing environmental conditions through the actions being considered.

[15] The baseline estimate for average abundance of chinook in Chambers Creek is zero, because WDFW currently operates the fish ladder and trap at the head of tidewater to allow no chinook to pass upstream and spawn naturally. However, the reported observations of chinook passing over the dam during extreme high tides may indicate some chinook utilization of the system.

One might conclude that the use of habitat measures alone in WRIA 10, even conducted on a very extensive scale is unlikely to achieve the fish production targets in this Basin (Pierce County, 2003). On the other hand, it is clear that implementing the actions will result in significant improvements in abundance, productivity and life history diversity. While abundance is the most visible sign of improved performance, increases in abundance will necessarily be dependent upon greater life history diversity and increased productivity.

The high benefit of habitat restoration actions that we are prioritizing support these elements of improved performance. We also recognize that protection of existing high quality habitat is important. Acquisition for conserving that habitat may be an important tool that we intend to evaluate in future updates of this strategy.

Table 2 also shows a reduction in life history diversity from historic conditions. Life history variants allow a species to use the available habitat more effectively, and these variants will not necessarily experience the same impact on overall productivity due to changes in habitat conditions affecting a specific life history stage. The losses of habitat areas historically used by these variant life history patterns have resulted in an overall loss of life history diversity. In Chapter 5, we describe the expected changes in performance (abundance, productivity and life history diversity) due to implementing various types of actions.

WRIA 12 coho show a sharp reduction in performance measures between historic and current conditions (*Table 2*). The average estimated spawning population size was approximately 700 fish under existing conditions, with a productivity of approximately six returning adults per parent spawner. The model estimated historic average abundance to be approximately 12,200 fish, suggesting that this basin was once highly suited to coho. Estimates of historic productivity are more than 36 returning adults per parent spawner.

Areas of WRIA 12 that would provide the most benefit for coho are located upstream of Steilacoom Lake and include all of the Clover mainstem, North Fork Clover Creek, and Spanaway Creek. The principal attribute classes or factors that rank highest for coho restoration benefit are generally sediment load, substrate stability, habitat types (e.g. pool frequency, back water pools), water quality characteristics and obstructions to fish passage.

Restoration of flow to the lower sections of Clover Creek, from Steilacoom Lake upstream to above the north fork confluence is necessary to achieve the benefits of habitat restoration. A recent retrospective analysis based on interviews of long-time residents and other sources provides evidence that until about 1940 Clover Creek sustained perennial flow.[16]

Pierce County plans to conduct pilot projects beginning in 2004 to identify effective ways to seal the streambed and thereby retain existing flows in the stream channel[17].

[16] Fred L. Tobiason, 2003. Historic Flows, Flow Problems and Fish Presence in Clover Creek – 1924-1942: Interviews with Early Residents.
[17] Pierce County Water Programs, 2003. Clover Creek Basin Plan.

Chapter 3

"DETERMINE LIMITING HABITAT FEATURES AND WATERSHED PROCESSES"

The loss of off-channel habitat in the lower river and estuary, and the disconnection of floodplain habitat in the Puyallup River are the primary causes of poor VSP parameters for Puyallup River chinook.

Alteration of natural flow regimes in the White River and loss of off-channel habitat are the primary causes of poor VSP parameters for White River Chinook.

Alteration in natural flow regime, the loss of riparian function, and habitat complexity and connectivity Are the primary causes of poor VSP parameters for WRIA 12 coho.

WRIA 10

Puyallup River

The performance of Puyallup River chinook is poor. The most significant habitat factors causing this and the associated life stage functions are as follows:

- Extensive loss of mainstem lowland floodplain off-channel habitat for fry colonization and juvenile rearing,
- Extensive loss of estuarine habitat and habitat diversity for salinity adaptation and juvenile rearing[18],
- Poor screening on the Electron diversion causes large losses of downstream migrant chinook[19]

White River

The performance of White River chinook is also poor. For chinook, the most significant habitat factors were the flow modifications produced by the PSE flow diversion to Lake Tapps and by operation of the Mud Mountain Dam flood control facility.

For chinook produced in the lower White, the next most significant was the loss of large woody debris, largely resulting from operations of the Mud Mountain Dam facility.

After the flow modification actions, seven of the top ten ranked actions for fish produced in the upper White River involved actions in the upper drainage. The top ranked action of these seven is Greenwater River LWD placement. The results indicate that the greatest benefits to upper river salmonids will tend to be achieved by actions conducted upstream of Mud Mountain Dam.

[18] There is uncertainty regarding the benefits of restoration in Commencement Bay. Newly created intertidal habitat in the Bay may become increasingly important as life history trajectories make use of the new areas.

[19] It has been estimated that upper Puyallup chinook production is not sustainable unless the large loss of down-stream migrant chinook juveniles into the canal is corrected.

After the flow modification actions, seven of the top ten ranked actions for fish produced in the upper White River involved actions in the upper drainage. The top ranked action of these seven is Greenwater River LWD placement. The results indicate that the greatest benefits to upper river salmonids will tend to be achieved by actions conducted upstream of Mud Mountain Dam.

Common Elements to White and Puyallup

For both the Puyallup and lower[20] White River chinook, except as noted, the principal attribute classes or factors that rank highest for chinook restoration benefit are generally channel (or substrate) stability and habitat diversity in the freshwater areas of highest importance to restoration. This reflects the benefit that would occur if side channels and backwaters were reopened and restored for use, primarily for fry colonization and juvenile rearing. These types of actions seem to be more beneficial for Puyallup chinook than for White River chinook, perhaps because of the dominant effect of hydro-modifications on White River fish.

WRIA 12

Chambers/Clover Creek

The performance of coho in WRIA 12 is poor because of the many alterations that have occurred in the basin over the past 150 years. Development activities have led to higher peak flows, excessive sediment load and gravel scouring. Removal of LWD and channelization has led to losses of habitat diversity, including pools and backwaters. Numerous obstructions to fish passage are blocking access to high quality habitat in some cases. Loss of flow in the central section of mainstem and North Fork Clover Creek creates a passage barrier as well as a loss of habitat area. Poor water quality has led to fish kills in the past – typically the result of first flush events on holding coho.

Coho utilize other streams within WRIA 12, but these streams are not considered a priority.

EDT Discussion:

The EDT analyses recently concluded builds on the results of the Limiting Factors Analysis (LFA) for WRIA's 10 and 12 (WCC 1999, 2003) and also uses information supplied by various assessments (culvert barrier inventories, etc.) to identify needed habitat improvements. The EDT analysis uses this background information and the knowledge of local experts in a conceptual model to estimate changes in population performance that should result from implementing identified habitat improvements. Pierce County is providing a staff person to continuously update the EDT inputs and use the model to evaluate operational hypotheses regarding system performance. In addition, web access to the model is under development so that others will be able to evaluate actions.

The WRIA 10 Limiting Factors Analysis Executive Summary (Washington Conservation Commission, 1999) succinctly summarized the salmon habitat conditions in the Puyallup River as follows:

[20] This document will refer to chinook produced below the PSE diversion dam as lower river fish, and to chinook produced above Mud Mountain Dam as upper river fish.

> "Commencement Bay, once a highly productive estuarine environment, has lost in excess of 98% of its historical intertidal and subtidal habitat. The remaining habitat is separated and in places contaminated with chemicals that further reduce its value to organisms and their biological processes. The Puyallup, White and Carbon Rivers are all contained within a revetment and levee system for their lower 26, 8 and 5 miles respectively. These channel containment structures have removed the natural sinuosity of the rivers and the spawning and rearing habitats that were once present. The two hydroelectric dams, and later a flood control project on the White River, have blocked salmon from their historical habitat and reduced their geographical distribution. Numerous other impassable barriers exist on smaller tributary streams that further reduce available spawning and rearing habitats. Land use practices have eliminated the opportunities for large and small woody debris recruitment and heavily impacted riparian buffers."

In WRIA 12, the LFA (WCC, 2003) notes that "The principal impacts to habitat have been caused by dredging and rerouting of stream channels, ditching or burying of the stream, elimination of wetlands and estuarine habitat, riparian forest removal, non-point water quality pollution, industrial discharges, fish passage barriers, and removal of large wood from channels."

The "Phase I" EDT analysis for WRIA 10 concluded that in the lower gradient mainstem rivers where restoration was most beneficial, the principal attribute classes or factors that rank the highest for chinook restoration benefit are channel (or substrate) stability and habitat diversity. This reflects the benefit that would occur from reopening and restoring side channels and backwaters primarily for fry colonization and juvenile rearing. In the estuary, habitat diversity, and habitat types, especially inter-tidal and nearshore habitat should be principal targets.

The "Phase II" EDT analysis for WRIA 10 provided estimates of improved chinook performance (abundance, productivity, and diversity index) expected by implementing identified restoration actions in those areas. By providing an estimate of the relative benefits from actions, the EDT analysis reflects the relative importance of different limiting factors. That is, actions which are estimated to provide a larger increase in abundance (or productivity, etc.) are necessarily addressing the more significant limiting factors; presuming that the list of actions is comprehensive and/or that synergistic groupings of actions are not overlooked. The program analyzed one hundred eleven individual actions, as well as logical groupings of actions (scenarios). Chapter 5 provides more information about prioritized actions. Project reports describe all actions in some detail. A summary report: *Strategic Priorities for Salmon Conservation and Recovery Actions in WRIA's 10 and 12 (DRAFT December 2003) provides a detailed discussion of the analysis results. The project reports are expected to be available in March 2004.*

In the Puyallup River Watershed the type of actions as a group that produced the greatest increases in abundance and productivity for chinook were levee setbacks, because these projects create side-channel, backwater, and off-channel habitat essential for juvenile colonization and rearing and protection from flood events. The same group produced the greatest increase in abundance for coho. In contrast, combined actions in South Prairie Creek, notably because of the actions opening access to off-channel ponds produced the largest increase in productivity for coho. This type of action tends to increase productivity more than abundance, though both are increased. These findings are consistent with the life history needs of the two species. Estuarine actions grouped together produced the second highest (as a group) increase in abundance for chinook. (Note: for purposes of this study, the estuary

extends from the river mouth upstream to the extent of tidal influence. The bay was considered separately.)

Because of ongoing restoration work by the Natural Resource Damage Assessment trustees under the federal Superfund (CERCLA) cleanup, Commencement Bay is not currently a high-priority for restoration in our strategy. However, we recognize the importance of nearshore habitat for WRIA 10 salmonids.

Based on assumptions of relatively short juvenile residence time within the Bay, the current results of EDT modeling show a relatively low benefit of restoration and protection actions in Commencement Bay. Although the modeling results seem to run counter to studies in other systems that show a great importance of nearshore habitat to juvenile chinook, the results are based on assumptions consistent with juvenile migration patterns described in reports of chinook life histories in Commencement Bay (e.g., Pacific International Engineering 1999, 2000, and 2000b; Port of Tacoma and Puyallup Tribe of Indians 1999). It should be noted that assumptions of longer residence time and greater survival yield modeling results that show an increased benefit of restoration in Commencement Bay.

Furthermore, it is possible that current residence times and migration patterns may not hold as shoreline habitat is restored. As more and more habitat is restored, juveniles may have a greater tendency to reside longer in these habitats, experiencing greater survival and growth than would occur with the movement pattern currently seen. At this time, however, it is unclear how beneficial restoration in Commencement Bay will be in the long-term.

Therefore, we think that our focus on freshwater habitat and the lower Puyallup River is an appropriate strategic division of labor, in that significant restoration activities are occurring in the Bay associated with Superfund projects, mitigation activities, DNR lands management, and other funding sources. In recent years there have been approximately 200 acres of intertidal habitat restoration in the Bay (Leslie-Ann Rose, Citizens for a Healthy Bay, personal communication, 2004). Such actions will improve salmonid habitat in the Bay.

Chapter 4

"HIGH-PRIORITY AREAS FOR RESTORATION"

The high-priority areas for restoration in WRIA 10 are the lower and middle Puyallup River, the lower White River, the lower Carbon River and the Puyallup estuary to address the low VSP parameters caused by river channelization and filling in the estuary.

The high-priority area for restoration in WRIA 12 is the mainstem Clover Creek above Steilacoom Lake. Clover Creek needs restoration on the mainstem to restore flow regimes and habitat connectivity, habitat complexity (LWD), and to remove barriers.

Figure 1 shows the high-priority areas, as well as near-term priority areas and projects for WRIA's 10 and 12 respectively.

WRIA 10

The loss of floodplain habitat that is limiting the performance of Puyallup and White River chinook is due to the channelization and confinement of the river within an extensive system of revetments and levees (flood works) in the mainstems of the Puyallup, White and Lower Carbon Rivers. Preferred projects in the mainstem areas would open and restore floodplain habitat such as side channels and backwaters. In general, the benefit increases as projects are located further downstream and as the projects become larger. The principal targets for estuary projects are those that increase habitat area, restore habitat diversity and habitat types.

Opening floodplain habitat in the lower mainstem rivers and increasing habitat diversity and types in the estuary provides the greatest restoration benefit to Puyallup River fall chinook abundance. These areas are described as follows, and are shown on *Figure 1.*

- Puyallup River Estuary, mouth to extent of tidal influence at about RM 6.0, near Clarks Creek.
- Puyallup mainstem, RM 6.0 to 24.5; from approximately Clarks Creek to the upstream extent of the levee system[21].
- Lower Carbon River mainstem, from its mouth at RM 17.9 on the Puyallup River to the canyon reach (RM 10).

[21] Significant actions have already occurred above RM 21.5. A right-bank setback levee was constructed from RM 23.2 to 24.8 in 1997-98. A left-bank setback levee from RM 21.5 to 22.2 is scheduled for construction in 2004. The levee system from RM 24.8 to 28.4 was severely damaged in 1996-97 and is no longer maintained.

Aside from the benefits of normal flow restoration, actions to open floodplain habitat and restore riparian function on the lower 9-10 miles of the White River mainstem would provide the greatest restoration benefits for lower river chinook.

Flow modifications that have resulted from the Mud Mountain Dam flood control reservoir and from the Puget Sound Energy flow diversion for the White River hydroelectric facility at Lake Tapps strongly limit White River spring chinook performance[22]. Restoration of normal flows in the diversion reach and more normal flow from the flood control reservoir were projected to produce the greatest benefits to all White River salmonids by a substantial margin over other actions, including chinook produced in the upper and lower river. Hydro modifications have a more pronounced effect on chinook produced below Mud Mountain Dam than on chinook produced in the upper watershed, though it is very significant for both. For chinook produced above Mud Mountain, the next most significant limiting factors are losses of large woody debris and poor riparian conditions.

The loss of estuarine habitat that is limiting the performance of both chinook stocks is due to channelization and confinement of the river by the flood works from the mouth upstream to the extent of tidal influence near Clarks Creek (RM 6.0).

WRIA 12

The top two actions modeled were LWD enhancement and nutrient enhancement. These ranked highest because the action presented to the model applied over large areas of the Watershed. Enhancement actions with a more limited scope are probably more realistically implemented, but with benefits roughly proportional to the area enhanced.

The areas of LWD and nutrient enhancement modeling included essentially all of Clover Creek above Steilacoom Lake, including the North Fork and Spanaway Creek. Coho abundance was increased about 28% and 35% by the LWD and nutrient actions respectively. The next six ranked actions each resulted in 15-22% increases in abundance. Three of these were barrier correction actions. The results for groups of actions show very significant increases in performance as actions were combined, with 200% increased coho abundance for all actions combined, excluding the flow restoration and channel reconstruction actions.

The model indicated high priorities for protection of Upper Clover Creek from Spanaway Creek confluence to source springs near Canyon Road. The area near the headwaters has relatively good habitat quality and perennial flow, which should be protected and enhanced[23].

Coho utilize other streams within WRIA 12 but these streams are not considered a priority.

The EDT project reports include descriptions of all the actions used in the modeling.

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[22] Throughout this document we refer to the effect of reduced flows in the bypass reach of the White River because of the Lake Tapps diversion. We evaluate the benefits to salmon that would occur by restoring flow, but acknowledge the interests of Lake Tapps homeowners in continuation of flows to the Lake and of continued power generation by the hydroelectric facility. The analysis assumed normal flows in the diversion reach, e.g. that the PSE diversion would not be operational. It seems likely that any increase in flows in the diversion reach would be beneficial, although not to the same degree as full flow restoration.

[23] Recent acquisitions of open-space in this area by Pierce County and the Cascade Land Conservancy include about 3000 feet of stream channel and over 25 acres of riparian area and associated wetlands.

Chapter 5

"IDENTIFY AND PRIORITIZE ACTIONS"

Levee setbacks[24] and estuarine habitat creation are the most beneficial types of actions needed for recovery of chinook to occur in WRIA 10. Increased flows in the hydroelectric diversion reach of the White River would also be very beneficial[25]. Removal of artificial barriers and restoration of habitat diversity[26] and riparian conditions in tributary streams with already good production is also beneficial.

In WRIA 12, the widespread addition of LWD to restore habitat diversity and complexity would be highly beneficial for coho performance. In Clover Creek and tributaries Morey Creek and Spanaway Creek, the correction of certain barriers in addition to restoring summer flows combined with riparian restoration and LWD to create habitat diversity and complexity would be the most beneficial actions.

In the "Phase II" EDT project, Mobrand Biometrics Inc. with the assistance of a TAG evaluated a total of 111 different actions in WRIA's 10 and 12 for Pierce County. Professional members of the advisory group, familiar with the Watershed or portions of the Watershed (the estuary), submitted the actions. There were 59 actions in the Puyallup/White upstream of the estuary and 25 in the Puyallup/White and Hylebos estuaries and Commencement Bay. There were 14 actions in Hylebos Creek[27], and 13 in WRIA 12. We used the EDT model to evaluate each individual action, and to evaluate logical groupings of actions (scenarios) to estimate increases in abundance, productivity and life history diversity. *Figure 2* through *Figure 5* show the predicted changes in performance.

As noted previously, the project documents describe each of the actions. Puyallup River actions (type and number) that were considered included:

- Electron Diversion screen modification (1)
- Levee setbacks (14)
- Oxbow or off-channel habitat reconnection
- Riparian corridor restoration
- LWD placement
- Fish passage barrier removal (37 barriers)

[24] Levee setbacks can result in re-connecting large areas of floodplain to the main river. They allow natural processes to create side-channel and off-channel habitat areas. Oxbow and off-channel habitat reconnections can provide similar benefits by providing water and fish access to existing habitat.

[25] Flow improvements in the diversion reach are under consideration because of re-licensing negotiations currently underway between Puget Sound Energy and the Federal Energy Regulatory Commission. It is likely that minimum flows will be substantially increased. Our strategy does not address this issue, but does consider the benefits to salmon that would result from flow increases.

[26] Habitat diversity includes pool/riffles, LWD, etc.

[27] Actions in the Hylebos are not further detailed here because they did not significantly benefit chinook.

Puyallup River

Chinook

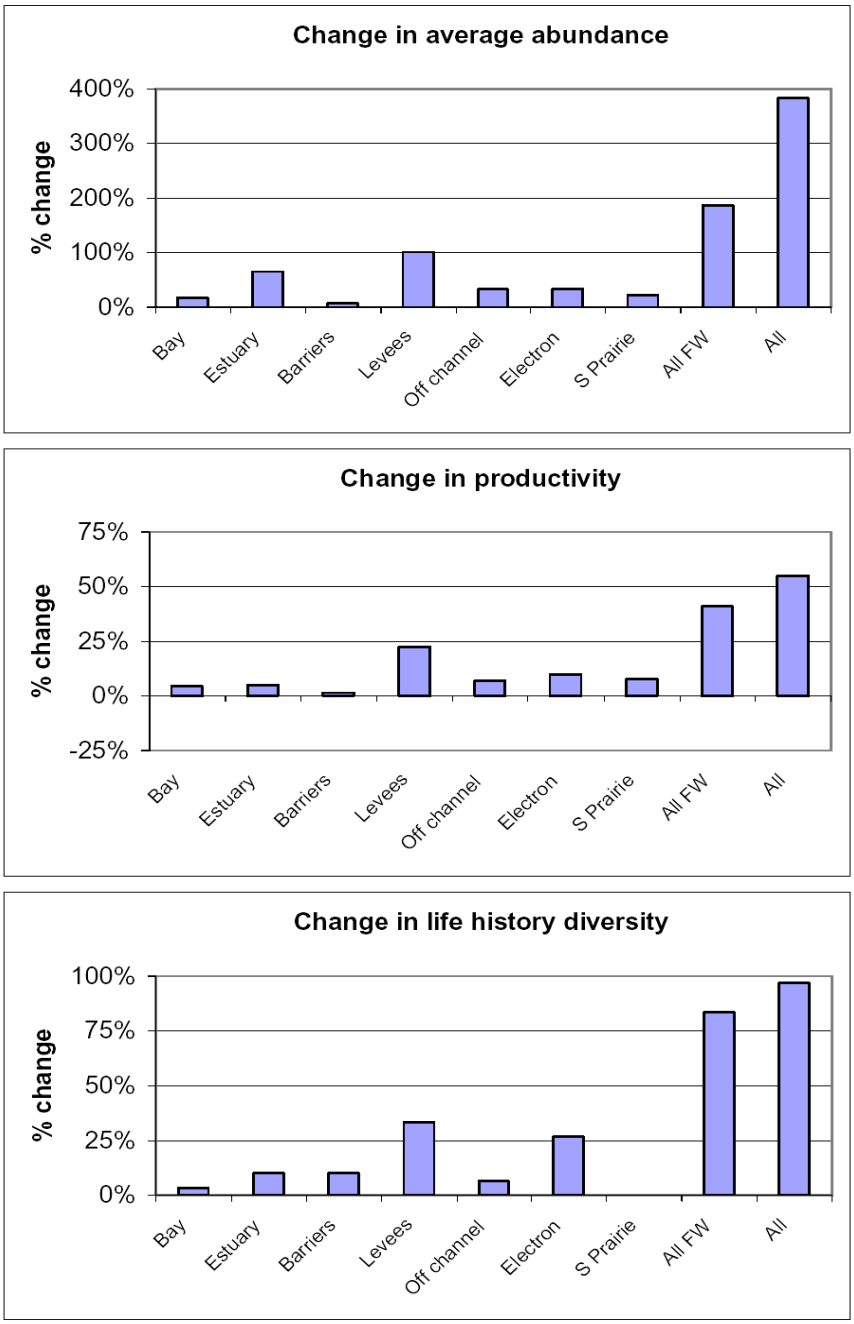

Figure 2. Change in performance of chinook by action groups for populations in the Puyallup River. Groups: **Bay** – all actions in Commencement Bay; **Estuary** – all actions in the estuary; **Levees** – all levee setback actions; **Off-Channel** – all actions adding off-channel habitat; **Electron** – Electron diversion screens; **S. Prairie** – all South Prairie Creek actions; **All FW** – all freshwater actions; **All** – all actions.

Upper White River Populations

Chinook

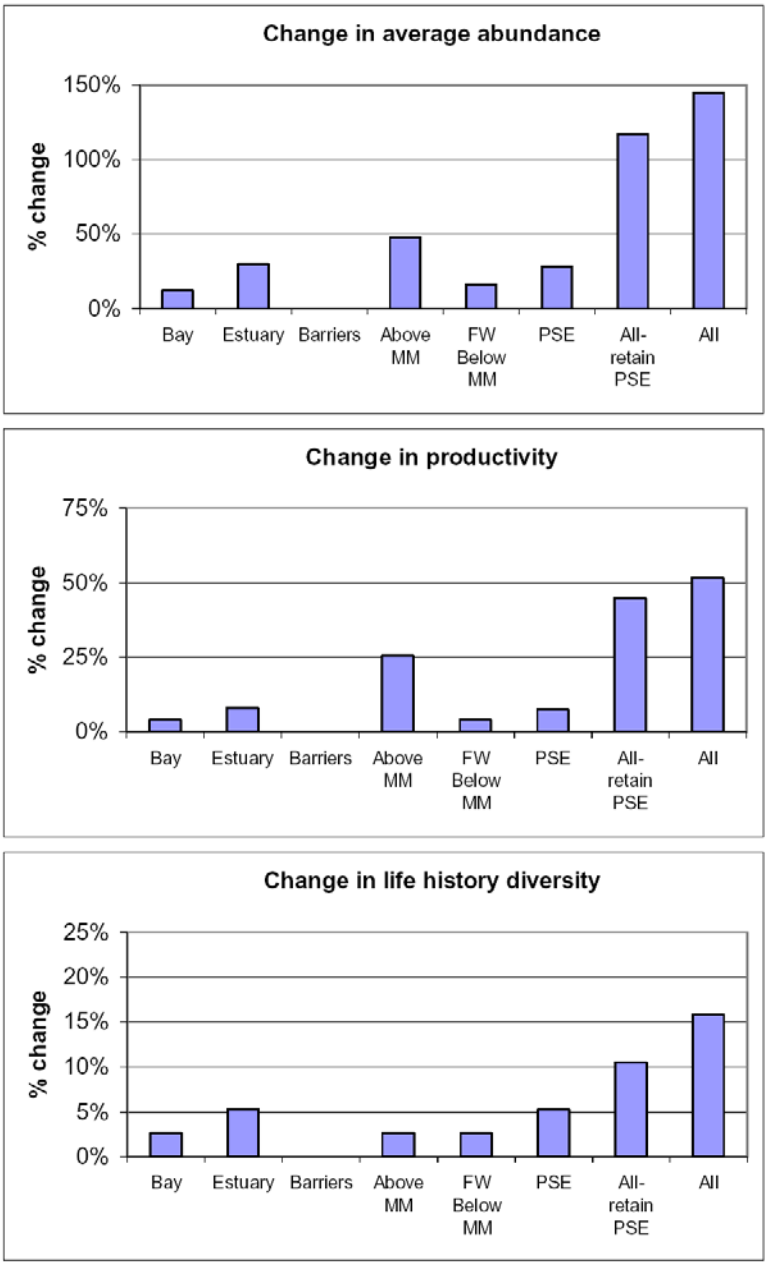

Figure 3. Change in performance of chinook by actions groups for the populations produced in the upper White River Watershed. Groups: **Bay** – all actions in Commencement Bay; **Estuary** – all actions in the estuary; **Barriers** – all passage barrier actions (except removal of PSE trap, PSE Dam, and Mud Mountain Dam); **Above MM** – all actions upstream of Mud Mountain Dam; **FW Below MM** – all actions below Mud Mountain Dam and upstream of the estuary; **PSE** – elimination of the PSE flow diversion; **All-retain PSE** – all actions except elimination of PSE Diversion and modification of flows released by Mud Mountain Dam; **All** – all actions except modification of flows released by Mud Mountain Dam.

Lower White River Populations

Chinook

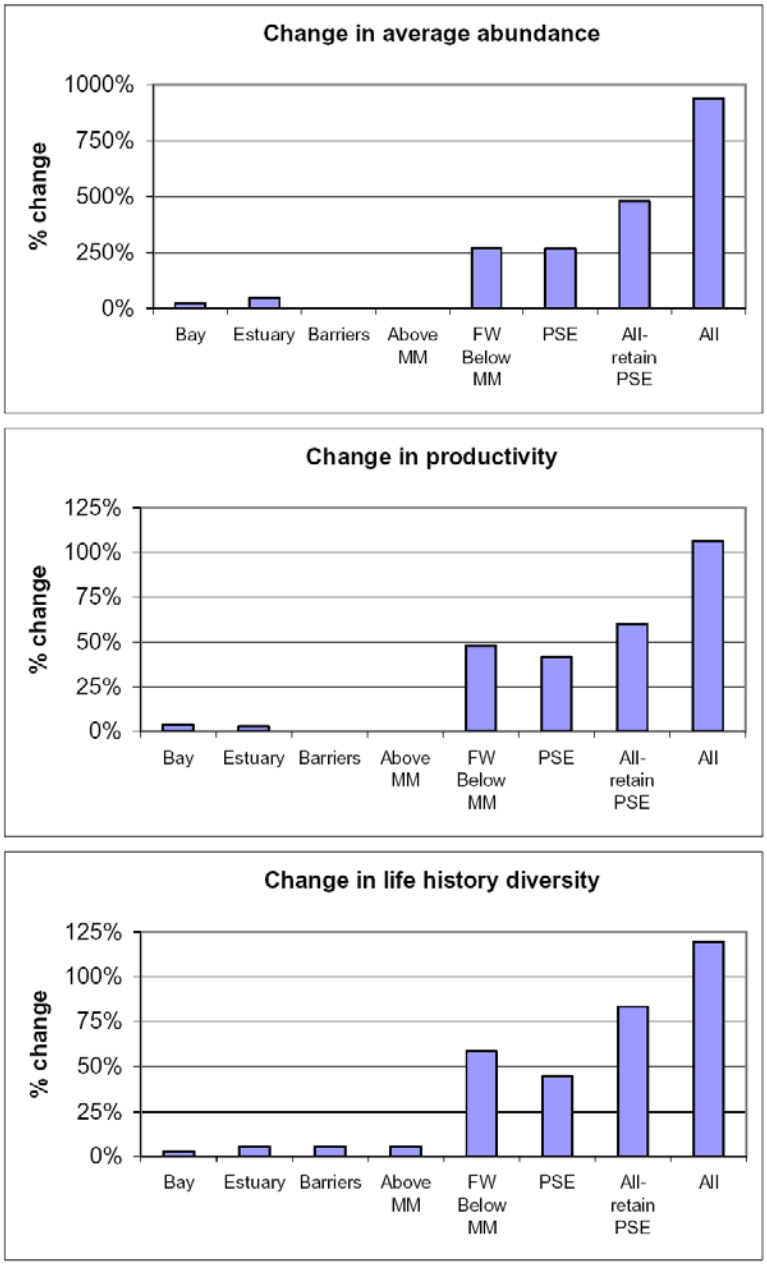

Figure 4. Change in performance of chinook by actions groups for the populations produced in the lower White River Watershed. Groups: **Bay** – all actions in Commencement Bay; **Estuary** – all actions in the estuary; **Barriers** – all passage barrier actions (except removal of PSE trap, PSE Dam, and Mud Mountain Dam); **Above MM** – all actions upstream of Mud Mountain Dam; **FW Below MM** – all actions below Mud Mountain Dam and upstream of the estuary; **PSE** – elimination of the PSE flow diversion; **All-retain PSE** – all actions except elimination of PSE Diversion and modification of flows released by Mud Mountain Dam; **All** – all actions except modification of flows released by Mud Mountain Dam.

Chambers-Clover Creek

Coho

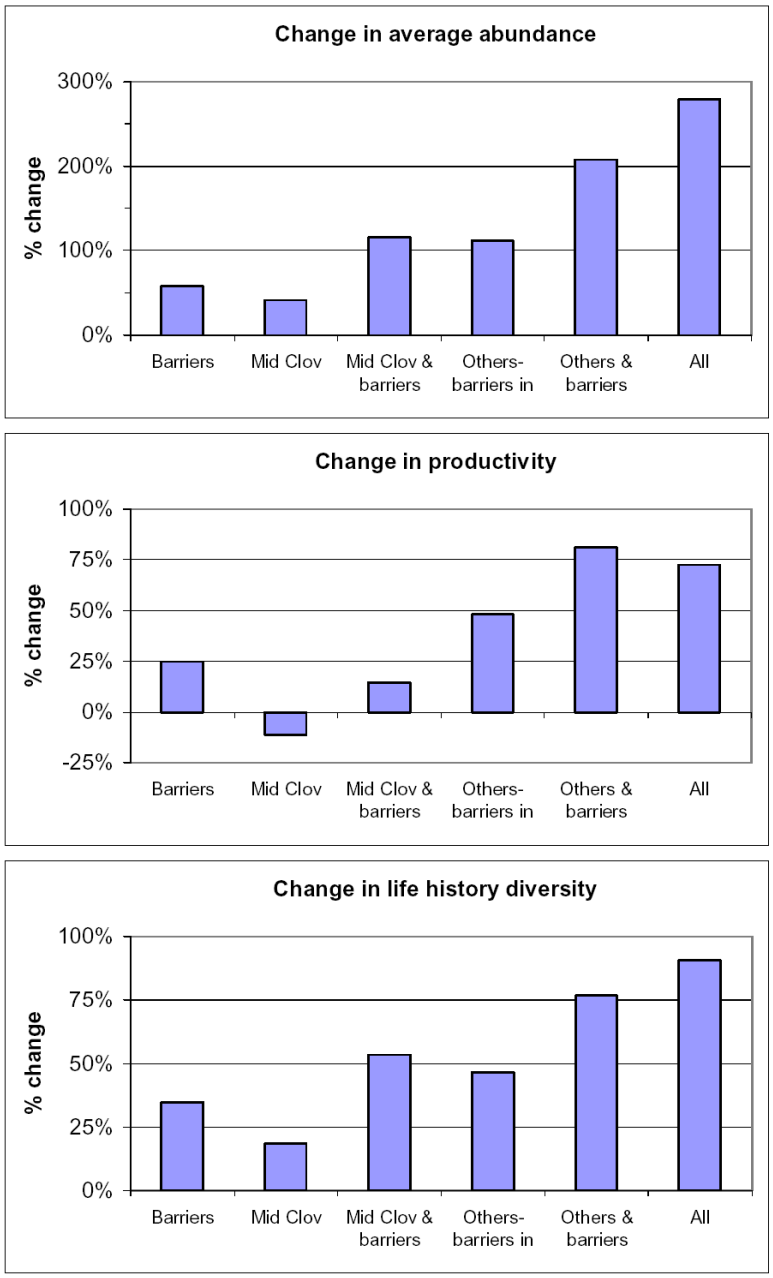

Figure 5. Change in performance of coho by actions groups in Chambers-Clover Creek. Groups: **Barriers** – all relevant barriers corrected; **Mid Clov** – channel reconstructed and flow restored in area of PLU (no barriers corrected); **Mid Clov & barriers** – channel reconstructed and flow restored in area of PLU with barriers corrected; **Others-barriers in** – all other actions (no barriers corrected); **Others & barriers** – all other actions with barriers corrected; **All** – all actions.

In the White River the types of actions included were:

- Levee setbacks (3)
- Restoration of flow to the PSE bypass reach (1)
- Riparian corridor restoration
- Channel reconstruction
- LWD placement
- Semi-normative flow restoration at Mud Mtn Dam (1)
- Forest road removal
- Bridge replacement
- Fish passage barrier removal (20 barriers)

There were 12 actions in the Puyallup estuary, 12 in Commencement Bay and 1 in the Hylebos estuary. The following types of actions were included:

- Creation of salt marsh/blind channels
- Creation of distributary channels
- Beach replenishment

The 13 actions considered in Chambers/Clover Creek included:

- Flow restoration in dewatered reaches
- LWD placement
- Beneficial nutrient resupply (e.g. salmon carcasses)
- Stream corridor acquisition and associated restoration
- Channel reconstruction
- Fish passage barrier removal (4 barriers addressed)
- Storm water detention facilities

The actions included in this analysis are conceptual in development. For instance, potential setback levee locations may have been identified based on evidence that the river had historically occupied that location and because the site is not now significantly developed. Certainly there are locations which were not included but which might be suitable sites. Significant further analysis is necessary to determine actual locations, extent and feasibility for levee setback projects.

Puyallup River

Among individual actions, the top ranked action for Puyallup chinook is the Electron diversion screen improvement. This action produces the largest projected increase in abundance (34%), productivity (10%) and life history diversity (27%) for any single action. This action was the clear winner for chinook in the Watershed.

Puyallup River Scenarios

Bay	All actions in Commencement Bay (12 projects)
Estuary	All actions in the Puyallup Estuary (12 projects)
Barriers	Physical barriers to fish passage corrected except those associated with the Electron Dam (37 barriers corrected)
Levees	All setback levee projects (14 projects)
Off Channel	All actions that primarily add off-channel habitat or access to off-channel habitat.
Electron	Modification to the Electron Diversion screens to remedy mortality issues
S. Prairie	All actions on South Prairie Creek (including barrier corrections and access to off-channel habitat
All FW	All actions affecting freshwater habitat
All	All actions combined (49 projects – some consist of multiple measures)

For the Puyallup, the scenario that produced the greatest increases in abundance and productivity for chinook was levee setbacks. The same scenario produced the greatest increase in abundance for coho.

Estuarine actions produced the second highest (as a group) increase in abundance for Puyallup fall chinook. Note that estuarine in this case refers to the Puyallup River, from the mouth to the extent of tidal influence near the mouth of Clarks Creek.

The EDT analysis identified the South Prairie Creek mainstem as a high-priority for protection, meaning that further degradation would have a large negative effect on chinook performance in that system. Restoration was a lower net benefit than some other areas because performance was already relatively good. Though it still contains relatively high quality habitat, indicators may not accurately reflect chinook performance in South Prairie Creek according to new information on the magnitude of inadvertent supplementation by hatchery fish[28]. Maintaining flow, substrate, stream bank and riparian characteristics in the system should receive high-priority. Interestingly, the highest ranking project for coho in WRIA 10 was an off-channel habitat re-connection project on South Prairie Creek – largely due to increased coho productivity from more off-channel rearing and over-wintering habitat.

White River

For fish produced in the upper and lower river, the top ranked individual actions were Mud Mountain Dam flow modifications and the restoration of normal flow in the PSE diversion reach[29]. These actions produced the greatest projected benefits to salmonids by a substantial

[28] Baranski, as cited in Mobrand, 2003 (EDT Phase II report).

[29] The action Mud Mountain flow modifications was modeled to include both changes in flow at the PSE bypass as well as a more normalized flow released from Mud Mountain Dam. We assumed that it would make little sense to

margin over other individual actions, giving some insight into how severely these hydrologic modifications have impacted the performance of salmonids in the White River. We included these actions in the analysis because increased flows in the diversion reach may be a requirement of the FERC re-licensing of the hydroelectric facility. Chapter 4 also discusses this issue.

White River Scenarios

Bay	All actions in Commencement Bay (12 projects)
Estuary	All actions in the Puyallup Estuary (12 projects)
Barriers	All physical barriers to fish passage corrected except those associated with the PSE Diversion and Mud Mountain Dam (addresses issues on 20 barriers)
Above MM	All actions upstream of Mud Mountain Dam (16 projects – some consist of multiple measures)
FW below MM	All actions downstream of Mud Mountain Dam (excluding those in the estuary/bay and those associated with the PSE Diversion or Mud Mountain (17 projects –some consist of multiple measures)
PSE	The action that remedies issues associated with the PSE Diversion (excludes flow modifications at Mud Mountain Dam)
All – retain PSE	All actions except those associated with the PSE Diversion or Mud Mountain Dam flow modifications (58 projects – some consist of multiple measures)
All	All actions except those involving flow modifications at Mud Mountain Dam (59 projects – some consist of multiple measures

For lower river fish, the second ranked group of actions included all freshwater actions downstream of Mud Mountain and upstream of the Puyallup confluence (17 actions). This group of actions produced approximately equivalent benefits to chinook as the action that eliminated the PSE bypass effects. This group of actions included several setback levees, floodplain reconnections, riparian restoration projects, redistribution of LWD from Mud Mountain reservoir, and significant restoration of Boise Creek. The combination of all actions in this area produced the greatest benefits to chinook compared to the groups that consisted of all actions in the other watersheds analyzed (producing nearly a 900% increase in chinook abundance in the lower White River). Boise Creek LWD enhancement and revegetation ranked among the top ten projects for lower river fish.

The relative benefits of actions differed significantly for chinook produced in the upper and lower drainages (e.g. above and below Mud Mountain Dam). This is in part an artifact of the more severely depressed performance of the lower river fish. For instance, the current abundance

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attempt to model normalized flow realized from the dam while still maintaining the PSE bypass with current operations. For this action, Mud Mountain flows would be modified to achieve more of a more normative pattern, except we assumed that only the most extreme floods would be reduced by temporary storage.

estimate of chinook produced in the lower river is about 1% of the historic abundance, while the upper river chinook abundance estimate is about 7% of historic abundance – thus any increase in the abundance of lower river fish is larger relative to the existing abundance. The estimated increases in abundance from all modeled actions are 1800 more chinook (spawners) in the lower river (from 200 currently estimated) and 725 more in the upper river (from 500 currently estimated).

For upper river fish, after the benefits of flow normalization, the results estimate that the greater benefits to upper river chinook will tend to be achieved by actions conducted upstream of Mud Mountain Dam. Riparian restoration and LWD placement in the Greenwater River and Huckleberry Creek were high benefit actions. The top ranked action in the upper river was Greenwater River LWD placement, which by itself is estimated to produce a nearly 40% increase in abundance for chinook and coho originating in the upper drainage. The remaining two projects in the top ten for the upper White were estuarine restoration actions.

Chambers/Clover Creek

Chambers/Clover Creek Scenarios

Barriers	Physical barriers to fish passage corrected (4 barriers)
Mid Clover	Clover Cr. channel reconstructed and low flow problem remedied
Mid Clover and barriers	Barriers corrected; with channel reconstructed and low flow problem remedied
Others – barriers in	All actions except those that address channel reconstruction and low flow correction, and barriers to fish passage
Others and barriers	All actions except those that address channel reconstruction and low flow correction
All	All actions combined (12 projects)

The top two actions for both coho and chinook were LWD enhancement and nutrient enhancement, applied extensively over many reaches in the system. This assumed coverage by these actions over many reaches is likely the reason the actions ranked over all others, which were more limited in scope. Coho abundance was increased about 28% and 35% by the LWD and nutrient actions respectively. The results indicate that increasing food organism abundance and quantity of LWD over extensive areas of the Watershed would produce highest increases in performance. We point out that we are unaware of any instances of significant attempts to increase beneficial nutrients in urbanized streams such as Chambers-Clover Creek. Research in British Columbia suggests that nutrient enhancement using briquettes composed of marine derived nutrients could produce significant increases in fish food organisms.
The next six ranked actions each resulted in 15-22% increases in coho abundance. Three of these were barrier correction actions, which are relatively easy to implement.

The results for combinations or groups of actions show very significant increases in coho performance. Projected increases for chinook are much smaller because of the more limited potential range of the species in the drainage. All actions combined except those involving re-channeling and flow restoration in Clover Creek between Spanaway Creek and North Fork Clover Creek, which would be the most difficult to implement, produced more than a 200% increase in coho abundance.

Chapter 6

"SOCIO-ECONOMIC OBJECTIVE (CAC)"

The Citizens Action Committee (CAC) places fundamental value on the best available science (as recommended by the TAG) when considering the merits of each project. However, salmon recovery cannot be divorced from the context of the surrounding community. Strong public support for salmon recovery is essential to the success of individual recovery projects, regional recovery and long-term taxpayer support to provide ongoing funding for salmon recovery projects. Conversely, a strategy that focuses solely on best available science while failing to build public support or worse yet alienating the public and potential local sponsors, may unwittingly contribute to the failure of salmon recovery. With this in mind, the CAC has created the following four categories as a tool or threshold to measure socio-economic values of each project.

Action: INCREASE PUBLIC RECOGNITION, SUPPORT AND STEWARDSHIP

As part of the strategy to build public support for salmon recovery projects, the lead entity and CAC will be requested to conduct a public education campaign explaining the needs and benefits of salmon recovery, including the advantages of resource protection and restoration importance of high-priority actions. To this end, the campaign will include the following activities each funding cycle:

- Pierce County will be requested to disseminate information in electronic and print media and to selected public service groups about our salmon habitat recovery and restoration strategy.
- Pierce County communications personnel will help distribute short articles to explain the general requirements of the state funding applications and the time line associated with the SRFB process.
- The CAC chair, TAG chair and the Lead Entity Coordinator will make themselves available for newspaper, radio, and television interviews. The Lead Entity Coordinator will pursue opportunities to speak before local civic groups and organizations.
- The Education Committee of the PRWC and the CCWC will be asked to include salmon recovery outreach (2496) in their annual work plans. Their contacts should include elementary, middle, high schools, colleges and universities.

Salmon recovery projects that include substantive volunteer and or public education components are essential to building public support for salmon recovery and cultivating stewardship ethic in the surrounding community. Consideration will be given to projects that:

- Include public education component relative to watershed health and salmon recovery.
- Increase the amount of preserved recognizable and or accessible open space and habitat.

- Foster a stewardship ethic by incorporating volunteer labor in to the project and or enhancing the local volunteer base through training or other programs.
- Involve private landowner participation, either by incorporating habitat features and native plants into their landscape or by participating in habitat conservation programs.
- Include schools.

Action: ENCOURAGE COOPERATIVE WATERSHED PARTNERSHIPS

To be successful, salmon recovery projects often require several different organizations working together in both funding and implementation. Because watersheds, and even sub-watersheds (or basins), typically cross jurisdictional and community boundaries, cooperative partnerships are also essential to comprehensive salmon recovery planning. Involvement of private landowners and businesses strengthens a strategic element of the community support. Consideration will be given to projects that:

- Involve partnerships between multiple jurisdictions.
- Involve public and private entities.
- Have a larger percentage of matching funds.

Action: SUPPORT INTEGRATED AND COMPATIBLE LAND USES

Recovery projects do not exist in isolation from surrounding land uses. Projects that are negatively impacted by land uses are less likely to succeed. Habitat conservation mechanisms enhance the potential for success.

Therefore consideration will be given to projects that:

- Are compatible with land uses at or surrounding the project.
- Include, or encourage the use of, long-term habitat conservation mechanisms, such as the Public Benefit Rating System or conservation easements.

Action: ECONOMIC SUCCESSES

Salmon recovery is inextricably linked to a sustainable economy. It is only when people are comfortable with their economic situation that they will be willing to give salmon the resources (water, habitat, etc.) that they need to survive. Therefore, projects that take economic concerns into account are more likely to help salmon recovery as a whole. Consideration will be given to projects that:

- Encourage businesses or industries to participate in restoring or preserving salmon habitat.
- Improve economic development opportunities because of the project actions.
- Conforms to economic, social or cultural development.

Chapter 7

"NEAR-TERM ACTIONS"

High-priority projects in WRIA 10 include construction of levee setbacks, restoration of estuarine habitat, or screening the Electron diversion. However, sponsorship capacity to implement those projects is limited, and we do not expect proposals in the near-term.

In the near-term, we will support other important projects that protect and/or improve habitat in presently productive streams or that correct barriers to high quality habitat.

Studies to identify high-priority levee setback and/or estuarine projects, assess their feasibility and prepare preliminary designs will also be high priorities.

In WRIA 12, projects to correct significant barriers on Clover Creek and its tributaries will be high-priorities. LWD and riparian restoration projects may be high-priorities if they are cost effective. Assessment(s) of the nearshore area that lead to restoration actions would be of high-priority.

We now know that the most important actions for salmon recovery in the Puyallup Watershed are large-scale floodplain reconnections to the mainstem rivers. These will be expensive and difficult to implement and will not occur soon or rapidly. However, efforts are underway to increase capacity and support for these actions.

We can accomplish other important actions in the near-term with moderate to high benefits and certainty. This chapter presents those near-term priorities.

A number of potential levee setback and floodplain re-connection projects have been identified on the Puyallup, White and Carbon Rivers. Generally, these projects are conceptual, and the list of projects is not comprehensive. The list of potential projects in the bay and estuary is similarly conceptual, although sponsors and funding (from other sources) may be more available[30].

Work is needed to identify potential setback levee projects and to evaluate their feasibility based on geomorphic, engineering, land use, and cost factors, so that the identified projects can be prioritized and project sponsors and funding can be sought. Feasibility analyses would be a high-priority in the near-term.

A project to place an effective screen on the Electron hydroelectric diversion canal would be a high-priority. Estimates that half the downstream migrant juveniles enter the diversion canal and trapping returns at best, only 20% of those to the river. This loss accounts for 40% of all downstream migrant fish, and may make populations in the upper river unsustainable. However, we expect no proposal for this project since it would be prohibitively expensive. Projects to protect and/or restore presently functional salmon streams are near-term high-

[30] We are attempting to compile (or find) an inventory of projects that are planned or completed in Commencement Bay and in the Puyallup Estuary, including mitigation and Superfund restoration projects (note: this product is in an early stage of development).

priorities. In WRIA 10, this includes South Prairie Creek and its tributaries, Boise Creek, the Greenwater River, and Huckleberry Creek.

In WRIA 12, projects to restore passage at the Morey Creek Dam, on Spanaway Creek at Breseman Forest, and at Shera's Falls on Clover Creek are high priorities. Projects to restore habitat diversity (LWD) throughout the Watershed may be high priorities if they are cost effective and properly sequenced relative to other restoration needs. A project to restore flow in the seasonally dry sections of Clover Creek is a high-priority. Expectations are that Pierce County will be conducting pilot studies/projects beginning in 2004 to determine an effective means to this restoration; and later will be implementing a flow restoration project. Assessment(s) of the nearshore area that lead to restoration actions would be of high-priority.

Table 1
"Long-term Priorities (High Benefit)"

Reach	Species	Habitat type	Recommended Action	Actions/Needs	Rationale	Comments
Puyallup Estuary (RM 0 – 6.0)	Chinook, coho, steelhead cutthroat	Rearing, refuge	Acquisition, restoration	Create off-channel estuarine habitat	high benefit for chinook fry rearing, osmoregulation	As a group, 2nd highest benefit type of project
Puyallup River (RM 6.0 to 22)	Chinook, coho, steelhead cutthroat	rearing	Acquisition and restoration	Setback levees, floodplain reconnection	High benefit for chinook fry colonization and rearing	As a group, highest benefit type project
White River (RM 0 to 10)	Chinook, coho, steelhead cutthroat	rearing	Acquisition and restoration	Setback levees, floodplain reconnection	High benefit for chinook fry colonization and rearing	As a group, highest benefit type project
Carbon River (RM 0 to 10)	Chinook, coho, steelhead cutthroat	rearing	Acquisition and restoration	Setback levees, floodplain reconnection	High benefit for chinook fry colonization and rearing	As a group, highest benefit type project
Puyallup River at Electron Dam (RM 31.2)	Chinook, coho, steelhead	Out-migration	screening	Need adequate screening on Electron diversion canal	80% loss of canal migrants	Highest ranked individual project

Table 2

"Near-term Priorities (Moderate – High Benefit)"

Reach	Species	Habitat type	Recommended Action	Actions/Needs	Rationale	Comments
S. Prairie Creek	coho, steelhead	Rearing	Restoration	Restore floodplain/wetland connectivity to the river	Benefits coho abundance and productivity	% increase in abundance and productivity
S. Prairie Creek	chinook, coho, pink, steelhead	Spawning, rearing	Protection Restoration	LWD, channel structure, sinuosity	Active spawning area	Habitat diversity limiting
Boise Creek	chinook, coho, steelhead	Spawning, rearing	Restoration	LWD, riparian	Benefits chinook abundance and productivity	2 of 10 top ranked projects for lower river fish
Clover Creek	coho	migration	Restoration	Barrier removal	15 – 22% increase in abundance from each project	Shera's Falls Morey Pond Breseman Forest Dam
WRIA 12 Nearshore	Chinook, chum	Juvenile rearing	Restoration	Barrier removal, intertidal habitat	Some uncertainty	Need assessment
Greenwater River	chinook	Spawning, rearing	Restoration	LWD, riparian	Ranked 3 &4 for upper river fish	
Huckleberry Creek	chinook	Spawning rearing	Restoration	LWD, riparian	Ranked 6th & 8th for upper river fish	

Chapter 8

"PROJECT RANKING CRITERIA FOR 5TH ROUND 2496 CITIZEN'S COMMITTEE"

Ranking Procedure

Initial Project Review: All project proposals submitted to the Lead Entity process will be reviewed by the TAG. The TAG will review proposals, develop a prioritized list of projects, and submit the list to the CAC for their review and approval. Proposed projects will need to be at least of medium benefit and certainty to be recommended for SRFB funding by the TAG. The TAG will meet with each project sponsor to discuss the merits of the project, including how well the project fits the WRIA's 10 and 12 Strategy and the SRFB selection criteria. The TAG may ask for additional information or provide suggestions on how to improve the fit, benefit and certainty of the project.

Project Ranking: The TAG will rank projects based on the following criteria and the strategy. Each member of the TAG will individually score and rank projects. The TAG will discuss the results, and members may be asked to provide their rationale for scoring individual criteria. Members may adjust their scoring and rank during the discussion. When finalized, the rank order provided by each member of the TAG will be used to calculate the mean rank order for each project. Mean rank order will determine the final rank order. The TAG will provide a memorandum describing its deliberations, with the ranked list of projects. Low benefit and/or low certainty projects will be forwarded to the CAC with a recommendation that they not be forwarded to SRFB.

Ranking Criteria:

Benefit (SRFB definitions, Jan 5, 2004 Draft)

• High benefit	8-10
• Medium benefit	5-7
• Low Benefit	0

Certainty (SRFB definitions, Jan 5, 2004 Draft)

• High certainty	4-6
• Medium certainty	1-3
• Low certainty	0

Fit to Strategy

• Project is specifically identified as a long-term high-priority	8-10
• Project is specifically identified as a near-term high-priority	8-10
• Project is consistent with a long-term high-priority	5-7
• Project is consistent with a near-term high-priority	5-7
• Project is not consistent with a priority area or action but would be a high/medium benefit and certainty action	1-4
• Other actions	0

The CAC will score projects based on the 13 bulleted social and economic criteria listed in section 6. Each member of the committee will rank each project by assigning a value from 0 to 10 points to each criteria element. This will provide a possible 130 Socio/Economic (S/E) points for each project.

So that the S/E scores will not exceed 15% of the total possible combined S/E and scientific scores, the S/E scores will be multiplied by a factor of 0.035 and added to the scores from the TAG ranking.

The total score will determine the projects ranking with the exception that the application of the S/E scores will affect the project's ranking only within the benefit category (high, medium, low) generated by the TAG ranking, and cannot move a project ahead of another project with a higher benefit rating.

CITIZENS COMMITTEE SOCIO/ECONOMIC SCORING SHEET

STRATEGY ELEMENT

INCREASE PUBLIC RECOGNITION, SUPPORT AND STEWARDSHIP	Maximum Points	Points
Include public education component relative to watershed health and salmon recovery.	10	
Increase the amount of preserved recognizable and or accessible open space and habitat.	10	
Foster a stewardship ethic by incorporating volunteer labor in to the project and or enhancing the local volunteer base through training or other programs.	10	
Involve private landowner participation, either in incorporating habitat features and native plants into their landscape or by participating in habitat conservation programs.	10	
Projects that include schools.	10	
	Sub Total (max 50)	

ENCOURAGE COOPERATIVE WATERSHED PARTNERSHIPS		
Involve partnerships between multiple jurisdictions.	10	
Involve public and private entities.	10	
Have a larger percentage of matching funds.	10	
	Sub Total (max 30)	

SUPPORT INTEGRATED AND COMPATIBLE LAND USES		
Are compatible with land uses at or surrounding the project.	10	
Include, or encourage the use of, long-term habitat conservation mechanisms, such as the Public Benefit Rating System or conservation easements.	10	
	Sub Total (max 20)	

ECONOMIC SUCCESSES		
Encourage businesses or industries to participate in restoring or preserving salmon habitat.	10	
Improve economic development opportunities because of the project actions.	10	
Conforms to economic, social or cultural development.	10	
	Sub Total (max 30)	

GRAND TOTAL (max 130)	

Appendix

"POLICY RECOMMENDATIONS"

WRIA 12

Our committee(s) prefer that unmarked (e.g. non-hatchery) chinook be passed upstream to spawn naturally. Chambers Creek habitat could be important for chinook by providing spawning and rearing habitats for use during periods of low habitat quality or reduced access to primary areas and by providing 'bridging points' that affect the likelihood of dispersal and re-colonization.

WRIA 10

The committee recommends continuation of a hatchery production role in the Puyallup-White basin, but a reform of hatchery practices that more directly addresses effective supplementation of natural production by hatchery fish.